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10/518,183	12/16/2004	Rainer Bott	M1211/20018	5602

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EXAMINER	
MALEK, LEILA	

ART UNIT	PAPER NUMBER
2611	

NOTIFICATION DATE	DELIVERY MODE
06/23/2009	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patents@crbcp.com

Office Action Summary	Application No.	Applicant(s)	
	10/518,183	BOTT ET AL.	
	Examiner	Art Unit	
	LEILA MALEK	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 09 April 2009.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-3,5,6,9,10,13-28 and 37-39 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-3,5,6,9,10,13-28 and 37-39 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 24 October 2007 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's argument filed on 04/09/2009 has been fully considered but it is not persuasive.

Applicant's argument: Applicant argues that Wiedemann fails to disclose limitation "the data signal is equalized and demodulated using the scatterer coefficients."

Examiner's Response: Examiner asserts that Wiedeman discloses a receiver apparatus comprising an equalizer and a demodulator, wherein the equalizer equalizes a Doppler frequency offset (interpreted as the first scatterer coefficient) for each correlated signal and the delay (interpreted as the second scatterer coefficient) of each of the correlated signals (see column 15, last paragraph). Wiedeman further discloses that the receiver includes circuitry for combining together all equalized correlated signals to provide a demodulator with a composite received signal (see column 15, last paragraph). In order to compensate for changes in the channel, equalizer needs to compensate for Doppler frequency offsets and for the propagation delay by equalizing the propagation delay and the Doppler frequency offset for each correlated signal. Therefore, Wiedeman clearly teaches that the data signal is equalized with the scatter coefficients (delay and Doppler frequency offset). Since Equalization has been performed by scatterer coefficients and Wiedeman discloses that the receiver includes circuitry for combining together all equalized correlated signals to provide a demodulator with a composite received signal, therefore the demodulation has also performed with the scatterer coefficients. Furthermore, since Applicant does not disclose any further

details for limitation "the data signal is equalized with the scatterer coefficients", examiner has given this limitation its broadest reasonable interpretation.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 13-26 and 37 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. As to claims 13, 14, and 37, Applicant, in invention's disclosure, fails to disclose how the scatterer coefficients are <u>used for receiving</u> the associated user data, in a way to enable one skilled in the art to use the same method. Claims 15-26 depend on claim 13, therefore they are rejected as well.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 3, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. ("Generation of scattering functions by computer simulation for mobile communication channels", Vehicular Technology Conference, 1996. 'Mobile

Technology for the Human Race'., IEEE 46th; Publication Date: 28 Apr-1 May 1996, Volume: 3, On page(s): 1443-1447 vol.3.), and Wiedeman et al. (hereafter, referred as Wiedeman) (US 5,796,760), and Chabah et al. (hereafter, referred as Chabah) (US 6,310,575), further in view of Filimon et al. (hereafter, referred as Filimon) ("LMS and RLS tracking analysis for WSSUS channels", Vienna Univ. of Technol.; This paper appears in: Acoustics, Speech, and Signal Processing, 1993. ICASSP-93., 1993 IEEE International Conference on Publication Date: 27-30 Apr 1993, Volume: 3, On page(s): 348-351 vol.3).

As to claim 1, Wang discloses a data signal transmitted via a time-variant channel to a receiver (see page 1443), wherein scatter coefficients including attenuation (see page 1444, left column), delay and Doppler frequency (see page 1444, right column) in the received data signal, which cause signal distortion in the channel, are measured in the receiver (see pages 1443 and 1444). Although Wang does not disclose that the signal is transmitted using a single-carrier or multi-carrier, in order to transmit the signals from transmitter to the receiver, inherently, there must be at least one carrier (single carrier). Wang discloses all the subject matters claimed in claim 1, except that the data signal is equalized with the scatterer coefficients and then demodulated with them. Wang also does not disclose that the scatterer coefficients are measured via a maximum likelihood criterion and wherein a recursive least square algorithm is used iteratively for the measurement of the scatterer coefficient. As to the first limitation, Wiedeman discloses a receiver apparatus comprising an equalizer and a demodulator, wherein the equalizer equalizes a Doppler frequency offset (interpreted as the first

scatterer coefficient) for each correlated signal and the delay (interpreted as the second scatterer coefficient) of each of the correlated signals (see column 15, last paragraph). Wiedeman further discloses that the receiver includes circuitry for combining together all equalized correlated signals to provide a demodulator with a composite received signal (see column 15, last paragraph). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang as suggested by Wiedeman in order to transmit the majority of the signal over the communication path (or paths) which are capable of conveying a highest quality signal (see column 16, first paragraph) and as the result increase the performance of the receiver. Wang and Wiedeman disclose all the subject matters claimed in claim 1, except that the scatterer coefficients are measured via a maximum likelihood criterion, wherein a recursive least square algorithm is used iteratively for the measurement of the scatterer coefficient. Chabah discloses a method for estimating Doppler frequency (see column 4, lines 37-43). Chabah teaches that the Doppler frequency (interpreted as Scatterer coefficients) is estimated for each candidate according to the known criterion of generalized maximum likelihood. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang and Wiedeman as suggested by Chabah to provide a fast and accurate estimation for Doppler frequency. Wang, Wiedeman, and Chabah disclose all the subject matters claimed in claim 1, except that a recursive least square algorithm is used iteratively for the measurement of the scatterer coefficient. Filimon, in the same field of endeavor, defines a scattering function according to Doppler frequency and time delay coefficients (see page 349, left column). Filimon discloses that the coefficients

can be measured by using a recursive least square algorithm iteratively (see page 349 right column, see $G_{rls}(\theta)$ and formula 11). Since Recursive Least Square (RLS) algorithms are known for having high convergence speed and high estimation accuracy, it would have been obvious to one of ordinary skill in the art at the time of invention to use RLS algorithm for measuring the scattering coefficients for the reasons stated above.

As to claim 3, Wang does not expressly disclose that the measurements have been taken place in the context of single-carrier data transmission schemes. However, in order to transmit the signals from transmitter to the receiver, inherently, there must be at least one carrier (single carrier).

As to claim 28, Wang discloses a scattering function with two variables (time delay and Doppler frequency). Although Wang does not expressly disclose that a dimension of a scatterer matrix to be included in an algorithm is adapted in each case in the basis of the scatterer coefficients previously determined, it would have been clearly recognizable to one of ordinary skilled in the art at the time of invention to save the values of time delay and Doppler frequency in a matrix after each measurement for further processing of the signal. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of invention to determine the dimensions of the matrix based on the scatterer coefficients previously determined to ensure that all the measurements have been properly saved in the matrix.

4. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang, Wiedeman, Chabah, and Filimon, further in view of Borowski (US 3,997,841).

As to claim 2, Wang discloses that the measurement of the scatterer coefficients has been taken place in the time domain (see the abstract and page 1443, right column). Wang, Wiedeman, Chabah, and Filimon, disclose all the subject matters claimed in claim 2, except that the equalization of the data signal takes place within the time domain. Borowski discloses that the advantages of the time-domain equalizers are that sufficient noise suppression can be achieved, which permits the use of a low-noise amplifier with sufficient control range (see column 1, paragraph 4). Therefore, for the reasons stated above, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang, Wiedeman, Chabah, and Filimon, to use a time domain equalizer to equalize the data signal.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang, Wiedeman, Chabah, and Filimon, further in view of Schenk et al. (hereafter, referred as Schenk) (US 6,647,076).

As to claim 5, Wang discloses that the measurement of the scatterer coefficients has been taken place in the frequency domain (see the abstract and page 1443, right column). Wang, Wiedeman, Chabah, and Filimon, disclose all the subject matters claimed in claim 5, except that the equalization of the data signal takes place within the frequency domain. Schenk discloses that a frequency domain equalizer is used for the channel equalization of a signal vector (see column 5, lines 35-40). Schenk further discloses that the frequency domain equalizers require a smaller outlay on circuitry than time domain equalizers and can be implemented as a simple and fast algorithm and as a simple circuit (see column 2). Therefore, for the reasons stated above, it would have

been obvious to one of ordinary skill in the art at the time of invention to modify Wang, Wiedeman, Chabah, and Filimon, to use a frequency domain equalizer to equalize the data signal.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang, Wiedeman, Chabah, Filimon, and Schenk, further in view of Schafhuber et al. (hereafter, referred as Schafhuber) (Adaptive prediction of time-varying channels for coded OFDM systems Schafhuber, D.; Matz, G.; Hlawatsch, F.; Acoustics, Speech, and Signal Processing, 2002. Proceedings. (ICASSP '02). IEEE International Conference on Volume 3, 13-17 May 2002 Page(s):III-2549 - III-2552 vol.3).

As to claim 6, Wang, Wiedeman, Chabah, Filimon, and Schenk disclose all the subject matters claimed in claim 6, except that the measurements of the scatterer-coefficients and the equalization of the data signal is in the context of multi-carrier data transmission schemes. Schafhuber, in the same field of endeavor, teaches determining a scattering function (see page 2549, right paragraph), and therefore inherently the scatterer-coefficients, and the equalization of the data signal (see Fig. 2) in the context of multi-carrier data transmission schemes (i.e. the OFDM) (see page 2549). It would have been obvious to one of ordinary skill in the art at the time of invention to use the teachings of Wang, Wiedeman, Chabah, Filimon, and Schenk, to make the system disclosed by Schafhuber more simple and cost effective.

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang, Wiedeman, Chabah, and Filimon, further in view of Ratnarajah et al. (hereafter, referred as Ratnarajah) (US 6,757,339).

As to claim 9, Wang, Wiedeman, Chabah, and Filimon, disclose all the subject matters claimed in claim 1, except that a first measurement of the scatterer coefficients is implemented with the assistance of a known data sequence. Ratnarajah discloses a method for estimating the sequence of transmitted symbols in a digital communication system (see the abstract). Ratnarajah discloses that the channel impulse response coefficients (i.e. interpreted as scatterer coefficients) are determined from training symbols embedded in the transmitted data sequence (See column 1, lines 37-49). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang, Wiedeman, Chabah, and Filimon, as suggested by Ratnarajah, to more accurately determine the coefficients.

8. Claims 10 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang, Wiedeman, Chabah, and Filimon, further in view of Smee et al. (hereafter, referred as Smee) (US 2003/0078025).

As to claim 10, Wang, Wiedeman, Chabah, and Filimon, disclose all the subject matters claimed in claim 1, except that the first measurement of the scatterer coefficients is implemented block-wise over an entire data sequence. Smee discloses a method (see Figs. 3 and 4) wherein the Doppler frequency (interpreted as scatterer coefficient) is measured in operation 304 with each frame of received data (see paragraph 0052) (i.e. interpreted as block-wise). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang, Wiedeman, Chabah, and Filimon, as suggested by Smee to increase the performance of the equalizer.

As to claim 27, Wang, Wiedeman, Chabah, and Filimon, disclose all the subject matters claimed in claim 1, except that the first measurement of scatterer coefficients is implemented with unknown useful data sequences. Smee discloses that the first measurement of scatterer coefficients is implemented with unknown useful data sequences, and that default values are used in the initialization of the algorithm instead of the training and synchronization sequences (see paragraph 0052 and Fig. 3). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang, Wiedeman, Chabah, and Filimon, as suggested by Smee to increase the performance of the equalizer.

9. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang and Wiedeman, further in view of Chabah.

As to claim 38, Wang discloses a data signal transmitted via a time-variant channel to a receiver (see page 1443), wherein scatter coefficients including attenuation (see page 1444, left column), delay and Doppler frequency (see page 1444, right column) in the received data signal, which cause signal distortion in the channel, are measured in the receiver (see pages 1443 and 1444). Although Wang does not disclose that the signal is transmitted using a single-carrier or multi-carrier, in order to transmit the signals from transmitter to the receiver, inherently, there must be at least one carrier (single carrier). Wang discloses all the subject matters claimed in claim 38, except that the data signal is equalized with the scatterer coefficients and then demodulated with them. Wang also does not disclose that the scatterer coefficients are measured via a maximum likelihood criterion. As to the first limitation, Wiedeman discloses a receiver

apparatus comprising an equalizer and a demodulator, wherein the equalizer equalizes a Doppler frequency offset (interpreted as the first scatterer coefficient) for each correlated signal and the delay (interpreted as the second scatterer coefficient) of each of the correlated signals (see column 15, last paragraph). Wiedeman further discloses that the receiver includes circuitry for combining together all equalized correlated signals to provide a demodulator with a composite received signal (see column 15, last paragraph). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang as suggested by Wiedeman in order to transmit the majority of the signal over the communication path (or paths) which are capable of conveying a highest quality signal (see column 16, first paragraph) and as the result increase the performance of the receiver. Wang and Wiedeman disclose all the subject matters claimed in claim 38, except that the scatterer coefficients are measured via a maximum likelihood criterion. Chabah discloses a method for estimating Doppler frequency (see column 4, lines 37-43). Chabah teaches that the Doppler frequency (interpreted as Scatterer coefficients) is estimated for each candidate according to the known criterion of generalized maximum likelihood. It would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang and Wiedeman as suggested by Chabah to provide a fast and accurate estimation for Doppler frequency. Regarding the last limitation of claim 38, Wang discloses a scattering function with two variables (time delay and Doppler frequency). Although Wang does not expressly disclose that a dimension of a scatterer matrix to be included in an algorithm is adapted in each case in the basis of the scatterer coefficients previously determined, it would have been clearly

recognizable to one of ordinary skill in the art at the time of invention to save the values of time delay and Doppler frequency in a matrix after each measurement for further processing of the signal. Furthermore, it would have been obvious to one of ordinary skill in the art at the time of invention to determine the dimensions of the matrix based on the scatterer coefficients previously determined to ensure that all the measurements have been properly saved in the matrix.

10. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang, in view of Wiedeman.

As to claim 39, Wang discloses a data signal transmitted via a time-variant channel to a receiver (see page 1443), wherein scatter coefficients including attenuation (see page 1444, left column), delay and Doppler frequency (see page 1444, right column) in the received data signal, which cause signal distortion in the channel, are measured in the receiver (see pages 1443 and 1444). Although Wang does not disclose that the signal is transmitted using a single-carrier or multi-carrier, in order to transmit the signals from transmitter to the receiver, inherently, there must be at least one carrier (single carrier). Wang discloses all the subject matters claimed in claim 39, except that the data signal is equalized with the scatterer coefficients and then demodulated with them. Wiedeman discloses a receiver apparatus comprising an equalizer and a demodulator, wherein the equalizer equalizes a Doppler frequency offset (interpreted as the first scatterer coefficient) for each correlated signal and the delay (interpreted as the second scatterer coefficient) of each of the correlated signals (see column 15, last paragraph). Wiedeman further discloses that the receiver includes circuitry for

combining together all equalized correlated signals to provide a demodulator with a composite received signal (see column 15, last paragraph). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Wang as suggested by Wiedeman in order to transmit the majority of the signal over the communication path (or paths) which are capable of conveying a highest quality signal (see column 16, first paragraph) and as the result increase the performance of the receiver.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEILA MALEK whose telephone number is (571)272-8731. The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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